



474026

Executive Summary

Remedial Investigation / Feasibility Study and Supplement Reports

***Allied Paper, Inc. / Portage Creek / Kalamazoo River
Superfund Site***

**Kalamazoo and Allegan Counties, Michigan
October 2000**

This Executive Summary presents an overview of the data, analyses, and other information compiled within the remedial investigation and feasibility study (RI/FS) reports for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site located in Kalamazoo and Allegan counties, Michigan. Also presented are findings from extensive additional analyses of the most up-to-date data available from the Kalamazoo River (collected in 1999 and 2000), which, at the request of the Michigan Department of Environmental Quality (MDEQ), are presented separately in the report titled Supplement to the Kalamazoo River RI/FS.

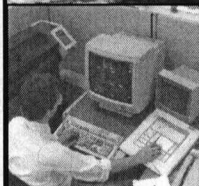
With oversight by the MDEQ, the Kalamazoo River Study Group (KRSG) has conducted the RI/FS to accomplish several objectives as directed by the 1991 Administrative Order by Consent (AOC), including:

- Identify sources of PCBs to the site (polychlorinated biphenyls the chemicals of concern at this site).
- Characterize the nature and extent of PCBs and other chemicals at the site.
- Identify PCB transport and exposure pathways to enable quantification of PCB fate and potential risks.
- Collect data sufficient to complete risk assessments and develop remedial alternatives to be evaluated in a feasibility study.
- Provide opportunities for local residents and other stakeholders to review site information.



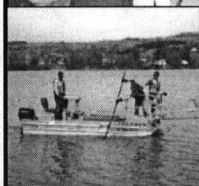
Background and Scope...

*See Page 2 and RI Sections 1 and 2
See Supplement Sections 1 and 2*



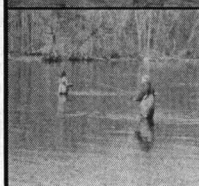
Data and Analyses...

*See Page 2 and RI Sections 3 to 5
See Supplement Section 3*



Risk Evaluation...

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Remedial Objectives...

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See Supplement Sections 3 and 4*



Remedial Alternatives...

*See Page 6 and FS Sections 3 to 6
See Supplement Section 4*



Additional Analyses and Update to the RI/FS...

See Supplement to the RI/FS

Site Background

For more than half of the 20th century, PCBs were legally used by many industries for manufacture of electrical components and other products that benefited from their fire retardant and other chemical properties. Between the late 1950s and early 1970s, used office paper sold for recycling often contained carbonless copy paper (also referred to as NCR paper). This carbonless copy paper incorporated an ink and PCB mixture. Through the process of recycling used office paper into new paper products, PCBs were released to the site through the mills' waste streams. After 1971, PCBs were removed from the manufacture of carbonless copy paper. By 1977, the potential adverse environmental and health effects of PCBs were better understood and the government banned most uses of PCBs.

The same chemical properties that made PCBs useful to industry are now responsible for persistent levels of PCBs remaining in the environment, including the Kalamazoo River. PCBs persist in the environment because they adhere readily to organic material in sediments and soils, and tend to bioaccumulate in the fatty tissue of fish and other animals.

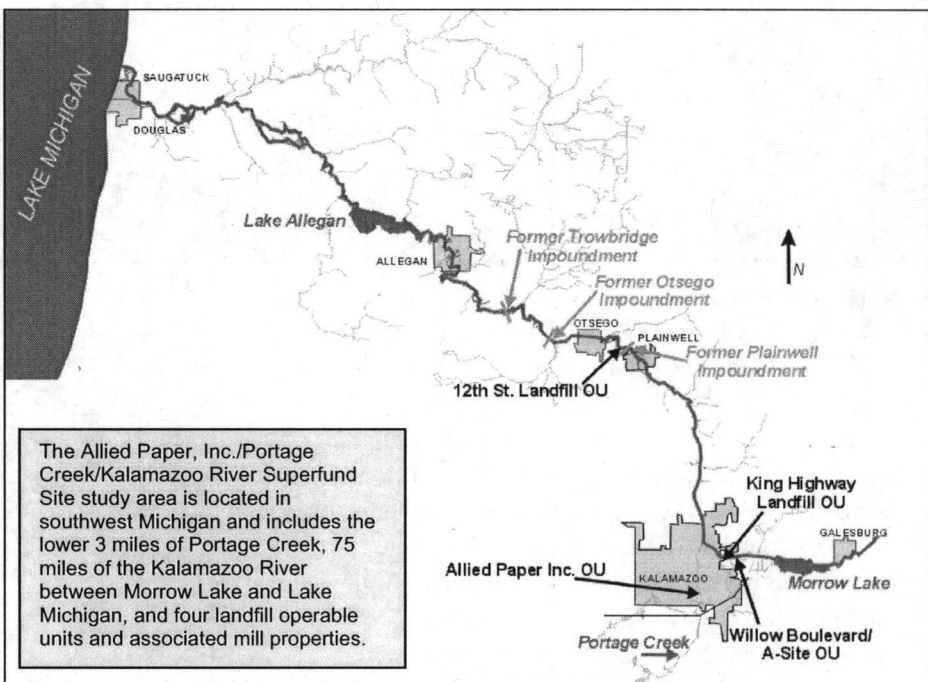
Due to PCBs in the Kalamazoo River, extensive environmental studies of surface water, sediment, floodplain soils, groundwater, air, biota, and several active and inactive industrial facilities have been underway since the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site was added to the National Priorities List (NPL) in 1990.

Under the 1991 AOC, the companies that make up the KRSR agreed to conduct the RI/FS for the Kalamazoo River, which began in 1993 after the Michigan Department of Natural Resources (MDNR) approved comprehensive work plans for the studies. Today, the KRSR includes Millenium Holdings, Inc., Georgia-Pacific Corporation, and Plainwell, Inc., all of which own or once owned paper recycling mills along the Kalamazoo River or Portage Creek.

The total geographic scope of the RI/FS stretches across 90 miles of river from Battle Creek to Saugatuck, and includes several investigations conducted between 1993 and 2000. These Phase I RI/FS reports focus on the river upstream of Lake

Allegan Dam; separate Phase II RI/FS reports will be issued for the lower river between Lake Allegan and Lake Michigan.

RI/FS activities are being managed by MDEQ under the federal Superfund program of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). As the lead agency on this site, the MDEQ is working cooperatively with the U.S. Environmental Protection Agency (USEPA) and other government agencies, as needed.



Remedial Investigation Summary

Extensive investigations of Kalamazoo River and Portage Creek sediments, surface water, floodplain soils, fish, and other biota are now complete or nearing completion. Starting in 1993, several distinct but related investigations began, including:

- Source Investigation
- Mills Investigation
- Floodplain Soil Investigation
- Sediment Investigation
- Surface Water Investigation
- Biota Investigation

These studies have yielded over 1 million data points, measurements, and observations that are now available for scientific and engineering evaluation, risk assessment, and risk management decision making.

OU or Mill Property	Remedial Action	Status of RI/FS Activities
Allied OU/Bryant Mill Pond	Capped 18-acre landfill and stabilized berms Excavated 150,000 cy from Bryant Mill Pond RI/FS and OU closure	Complete Complete Ongoing
King Highway Landfill OU	Capped 23-acre site and stabilized berms	Complete
Willow Boulevard/A-Site OU	Excavated 7,000 cy and stabilized A-Site berms RI/FS and OU closure	Complete Ongoing
12th Street Landfill OU	RI/FS and OU closure	Ongoing
Former Allied Paper Bryant Mill	Sampling indicated no action necessary	Complete
Former Allied Paper King Mill	Excavated 11,000 cy to date; further work needed	Ongoing
Former Allied Paper Monarch Mill	Sampling indicated no action necessary	Complete
Georgia-Pacific Kalamazoo Mill	Excavated 33,000 cy and restored area	Complete
(Simpson) Plainwell Mill	Cleaned storm sewers	Complete
King Street Storm Sewer Area	Excavated 5,000 cy and restored area	Complete

While the Kalamazoo River RI/FS has been underway, significant voluntary remedial actions and additional RI/FS efforts have been moving forward at the four landfill operable units (OUs) and other locations of the site, as summarized in the table above. The OUs are being managed separately to allow work to progress concurrently with the much larger river investigations. The four OUs are the Allied Paper, Inc. OU on Portage Creek, King Highway Landfill OU and Willow Boulevard/A-Site OU both in Kalamazoo, and the 12th Street Landfill OU in Plainwell.

To date, over 5,000 samples of sediment, soil, water, and biota have been collected from the Kalamazoo River and analyzed for PCBs and other chemicals. The bulk of the data presented in the RI/FS reports are from 1993 and 1994, when the first large-scale sampling occurred on the river. However, investigations continue today with additional data being collected throughout the river to further refine evaluations of PCB sources, distribution, potential transport (movement), and risks.

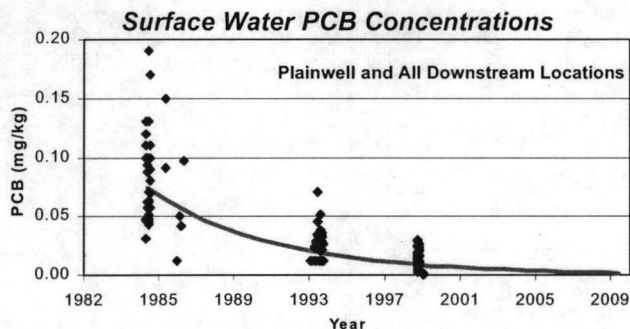
The Supplement to the Kalamazoo River RI/FS presents the most up-to-date findings of these additional studies, focusing particularly on how conditions have continued to improve during the 1990s. The Supplement also describes how new tools are under development to help MDEQ and others determine the best course of action for improving the Kalamazoo and further reducing risks. For example, scientists are developing a sophisticated computer-based mathematical model of the Kalamazoo River to better understand the movements and fate of sediment and PCBs in the river. This new tool, and the new data used to develop it, is fully discussed in the Supplement report, including how it has been used to evaluate current conditions in the river and how potential future remedial actions would improve those conditions.

The three primary conclusions that can be drawn from the remedial investigation are:

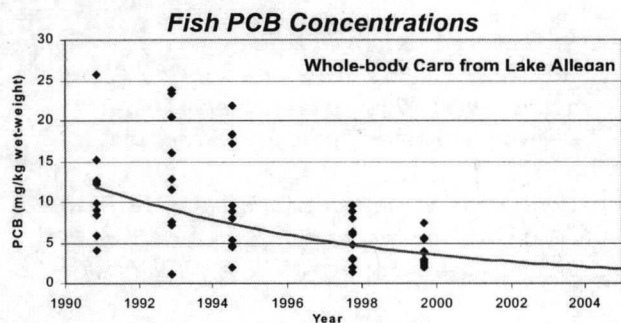
- ***PCB concentrations in fish, surface water, and surface sediment have decreased significantly over the past 20 years as a result of natural recovery processes in the Kalamazoo River.***
- ***Continuing uncontrolled sources of PCBs are depressing the rate of natural recovery and playing an increasing role in potential risks.***
- ***PCB concentrations in submerged sediment are low and relatively evenly distributed throughout the site. There are no apparent "hot spots" where a large mass of PCBs is concentrated within a small volume of sediment.***

As shown in the figure on the next page, multiple lines of evidence support the conclusion that PCB concentrations have decreased markedly over the past two decades due to natural recovery processes. Natural recovery (technically called "natural attenuation") occurs when the physical, chemical, or biological processes in nature degrade or isolate contaminants over time. Because the Kalamazoo River is dominated by several dams and impoundments, the physical process of PCB and sediment burial removes PCBs from the uppermost surface layer of the sediment bed (in impounded areas) where they would otherwise be available for uptake by fish and other organisms.

RI and the latest supplemental data confirm that natural recovery is active in the Kalamazoo River and is responsible for the observed decrease of PCB levels in fish and surface water. The figure below shows these declines, which have already decreased exposure and potential risks, and are expected to continue into the future.



Natural recovery of the Kalamazoo River is evident in how dramatically PCB levels in surface water and fish have fallen during the 1980s and 1990s. The above graph shows decreases in water, and the graph below shows how PCB levels in Lake Allegan fish (carp in this example) have declined over time. Additional sampling is continuing this year to confirm these trends and similar decreases observed in other fish species and in surface sediments.



In contrast to the positive gains from natural recovery, the RI identified several uncontrolled sources of PCBs that continue to impact the system today. The most significant of these is the erosion of PCB-containing material from what used to be submerged sediments in the three MDNR-owned former Plainwell, Otsego, and Trowbridge impoundments (see photo below).



Former sediments like these had been submerged in MDNR's three impoundments until the 1970s when the MDNR drew down its impoundments to present levels. Today these former sediments are exposed above the water line and have become a major source of PCBs as they slowly erode into the river.

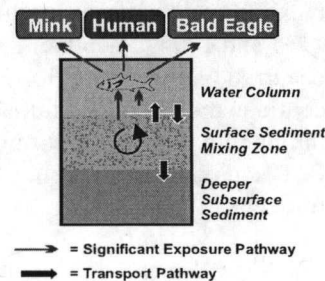
When MDNR drained the impoundments in the 1970s, these former sediments were left above today's water line and now contribute up to 100 kg of PCBs to the river each year. If this source of PCBs were controlled, the rate and effectiveness of natural recovery would increase and risks would further decrease.

The thousands of sediment data points collected from the river show that PCB concentrations in channel sediments are low. In fact, 76% of surface sediment samples had PCB concentrations below 1.0 mg/kg, and 97% were less than 10 mg/kg. Further, there are no PCB "hot spots" in these sediments that would need to be remediated to reduce localized exposure.

Evaluation of Potential Risks

The Michigan Department of Community Health (MDCH) and the Agency for Toxic Substances and Disease Registry (part of the U.S. Department of Health and Human Services) agree that recreational activities such as boating, swimming, and wading in the Kalamazoo River are safe. This is because water and sediment PCB concentrations are low and the potential amount of PCB that could be absorbed through the skin is small. Based on risk assessments conducted for the river, consumption of fish is the only significant PCB exposure pathway for both humans and ecological receptors like bald eagles and mink.

"Bioavailable" PCBs are those located in the water column or surface sediment. From there, PCBs can accumulate in fish and be passed to people or wildlife if those fish are eaten. Or, natural attenuation processes ongoing in places like Lake Allegan (right) can bury PCBs in the sediment bed where they become unavailable for exposure or transport.



While MDEQ's initial screening-level ecological risk assessment found that certain song birds and small mammals might have been at risk from exposure through the terrestrial (land-based) food web, more in-depth studies by Michigan State University scientists using up-to-date plant data from the site show that these animals are not at risk from PCBs. This is further explained in the Supplement to the RI/FS.

As shown in the figure above, fish play a central role at this site because they concentrate PCBs. These PCBs are then passed up the aquatic (water-based) food chain and may pose risks if receptors such as people, mink, or bald eagles eat too many fish or eat them too often.

PCBs in surface sediments or the water column will wind up either buried in deep sediment where they are not available for exposure, or will find their way into fish and eventually into the people and animals who eat those fish.

Overall, the risk evaluations conducted thus far on the Kalamazoo River show that reducing PCB levels in fish is the key to reducing potential risks to anglers and fish-eating wildlife. Thus, the goal of any additional remedial action at the site must be to reduce PCB levels in fish in a way that does not increase risks or reverse the significant benefits already gained through more than 20 years of natural recovery.

Remedial Response Objectives

Remedial response objectives (RROs) are the specific goals that a remedial plan must meet to be considered successful in reducing risks. RROs are the starting point for developing and evaluating remedial options in the feasibility study, leading eventually to selection and implementation of a remedial plan for the site.

Both the RI report and Supplement to the RI/FS show conclusively that the natural processes at work in the river are responsible for the observed decreases of PCB concentrations in fish, the water column, and surface sediments. However, the RI identified sources that continue to put PCBs into the river today. The predominant source is erosion of the riverbanks within MDNR's three former impoundments. Controlling these sources would have the double benefit of reducing the amount of PCBs in river water carried downstream to be deposited in Lake Allegan or Lake Michigan, and speeding up the rate of natural recovery. Both improvements would further reduce PCB levels in fish.

Given these considerations, the primary goal (or RRO) for any remedial plan for the Kalamazoo River is to:

- ***Reduce PCB concentrations in Kalamazoo River fish tissue to acceptable levels in terms of human health and ecological risk.***

Related goals that would improve the overall quality of the river and continue to help reduce potential risks associated with eating Kalamazoo River fish are:

- ***Reduce water-column transport of dissolved or particle-bound PCB to Lake Michigan.***
- ***Reduce PCB loading to the Kalamazoo River.***

Feasibility Study Summary

To accomplish the remedial objectives and protect human health and the environment, specific remedial technologies and strategies have been developed and evaluated in the site's feasibility study. This detailed engineering study describes several remedial options and evaluates them against key decision making criteria required by CERCLA and NCP regulations.

For the Kalamazoo River, the potential remedial approaches available fall into 12 categories (called general response actions, see box below) for managing site risks, ranging from no further action to technologies such as sediment capping or removal. Within these categories, a total of 66 specific options were evaluated in the feasibility study in terms of their effectiveness, implementability, and relative cost.

General Response Actions Considered in the Kalamazoo River Feasibility Study

No Further Action No additional action would be taken.

Source Control Continuing sources of PCBs would be identified and eliminated or reduced.

Institutional Controls and Monitoring Fish consumption advisories, dam maintenance, and other administrative measures would be used to reduce PCB exposure. Long-term monitoring tracks changes in site conditions over time.

Monitored Natural Attenuation Natural processes reduce PCB exposure over time, which would be verified periodically through an extensive long-term monitoring program.

In-place Containment Natural or engineered barriers stabilize and isolate PCBs in place. Sediment capping and stabilization of eroding riverbanks are two examples.

Hydraulic Modification The river channel itself would be modified or moved to reduce PCB exposure and transport.

Sediment Treatment Sediments would be treated in place or after removal to reduce toxicity and volume.

Sediment Removal Sediments would be removed via hydraulic dredges or mechanical excavation.

Sediment Dewatering Sediments removed from the river would contain large amounts of water that would need to be removed prior to sediment disposal.

Sediment Disposal Once removed, sediments would be transported off-site to existing landfills or put into on-site confined disposal facilities (CDFs) built near the river.

Residuals Management Treatment or other wastes would have to be properly managed to prevent exposure.

Fisheries Management Includes measures to remove PCB-containing fish or modify their habitat.

From this initial screening process, the technologies and specific options considered most feasible were assembled into remedial alternatives for detailed evaluation and cost estimating. Thus, five remedial alternatives, listed in the box below, were developed for the Kalamazoo River and fully evaluated within the feasibility study and Supplement to the RI/FS.

Remedial Alternatives Evaluated in the Kalamazoo River Feasibility Study

Alternative 1

- No further action
- No cost

Alternative 2

- Institutional controls (e.g., fish consumption advisories)
- Long-term monitoring
- \$1,186,000 total cost

Alternative 3

- Source control through stabilization of riverbanks in former Plainwell, Otsego, and Trowbridge impoundments (would stop major source of PCB transport to river)
- Monitored natural attenuation (long-term monitoring of natural recovery; maintenance of bank stabilization)
- Institutional controls (e.g., fish consumption advisories)
- 6 years to implement
- \$73,186,000 total cost

Alternative 4

- River-wide capping of all submerged sediments (placement of cap barrier over all 2,895 acres of river)
- Source control through stabilization of riverbanks in former Plainwell, Otsego, and Trowbridge impoundments
- Institutional controls (e.g., fish consumption advisories)
- Long-term monitoring and maintenance
- 40 years to implement
- \$1,734,382,000 total cost

Alternative 5

- River-wide dredging of all submerged sediments (removal of over 16,000,000 cubic yards of sediment)
- Disposal in on-site confined disposal facilities to be built
- Source control through stabilization of riverbanks in former Plainwell, Otsego, and Trowbridge impoundments
- Institutional controls (e.g., fish consumption advisories)
- Long-term monitoring and maintenance
- 25 years to implement
- \$2,618,445,000 total cost

To identify the preferred remedial plan, the five alternatives were evaluated, individually and comparatively, against nine criteria required by CERCLA and the NCP. The criteria and the key question each alternative must address are:

- **Overall Protection of Human Health and the Environment** – Does the alternative reduce risks and maintain protectiveness over time? Are all remedial response objectives met?
- **Compliance with Applicable or Relevant and Appropriate Requirements** – Does the alternative comply with all ARARs, or are waivers necessary?
- **Long-Term Effectiveness and Permanence** – Does the alternative maintain protection of human health and the environment after response objectives have been met?
- **Reduction of Toxicity, Mobility, or Volume through Treatment** – Does the alternative use treatment to reduce the mobility, toxicity, or volume of PCBs?
- **Short-Term Effectiveness** – How does construction of the alternative affect human health and the environment?
- **Implementability** – Is the alternative technically and administratively feasible? Are trained workers and necessary equipment and materials readily available? How long will the project take?
- **Cost** – How much will it cost to implement and maintain the alternative and monitor its effectiveness?
- **Agency Acceptance** – Is the alternative acceptable to state and federal agencies?
- **Community Acceptance** – What concerns do local residents and other stakeholders have?

The chart on the next page summarizes the findings of the detailed evaluation of remedial alternatives presented in the feasibility study. The resulting preferred alternative is summarized on page 8.

Note that the last two criteria (Agency and community acceptance) are not evaluated at this time. Rather, they are considered after receiving public comment on the formal Proposed Plan during the associated public comment period. MDEQ then addresses public concerns in the Responsiveness Summary section of the Record of Decision (ROD) document.

Additional site-specific information and evaluations of the remedial alternatives are presented in the Supplement to the RI/FS.

Kalamazoo River Remedial Alternative Evaluation Matrix

NCP CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5
Overall Protection of Human Health and the Environment	<ul style="list-style-type: none"> Reduces risk through natural attenuation. Limited achievement of RROs. Overall protection limited by continuing PCB inputs that will slow rate and effectiveness of natural recovery. 	<ul style="list-style-type: none"> Reduces risk through natural attenuation. Limited achievement of RROs. Protection enhanced by fish consumption advisories and monitoring natural recovery. 	<ul style="list-style-type: none"> Reduces risk through source control by stopping erosion of former sediments from riverbanks of MDNR's three former impoundments. All RROs achieved. 	<ul style="list-style-type: none"> Reduces risk by minimizing PCB loads from eroding bank sediments and isolating/capping PCB in place. Natural recovery disrupted during the 40-year project. No additional risk reduction over Alternative 3. All RROs achieved, but on a protracted time frame. 	<ul style="list-style-type: none"> Dredging targets removal of PCB mass but cleanup goals are unlikely to be obtained. Natural recovery disrupted during the 25-year project. No additional risk reduction over Alternative 3. All RROs achieved, but on a protracted time frame.
Compliance With ARARs	<ul style="list-style-type: none"> PCB water quality standards would need to be waived. 	<ul style="list-style-type: none"> PCB water quality standards would need to be waived. 	<ul style="list-style-type: none"> PCB water quality standards would need to be waived. 	<ul style="list-style-type: none"> PCB water quality standards would need to be waived. 	<ul style="list-style-type: none"> PCB water quality standards would need to be waived.
Long-term Effectiveness	<ul style="list-style-type: none"> Natural recovery would continue to reduce risks to both humans and wildlife. Effectiveness not monitored. 	<ul style="list-style-type: none"> Natural recovery would continue to reduce risks to both humans and wildlife. Effectiveness ensured through maintenance of impoundments and dams. Long-term monitoring will track effectiveness. 	<ul style="list-style-type: none"> Would decrease PCB in fish, water, and surface sediments over long-term. Proper design, maintenance, and enhanced monitoring program would assure long-term reliability. 	<ul style="list-style-type: none"> Potentially reliable & effective. Construction would take 40 years, delaying benefits. Impact to benthic community may be irreversible. Flood flows could be altered and flood capacity decreased, thus increasing erosion. 	<ul style="list-style-type: none"> Potentially reliable & effective. Assumption that PCB cleanup goals would be met is likely optimistic. Benthic community and habitat completely destroyed Fishery impacts uncertain and recovery potential unknown.
Reduction of Toxicity, Mobility, or Volume through Treatment	<ul style="list-style-type: none"> No reductions through treatment. 	<ul style="list-style-type: none"> No reductions through treatment. 	<ul style="list-style-type: none"> No reductions through treatment. 	<ul style="list-style-type: none"> No reductions through treatment. 	<ul style="list-style-type: none"> Treatment is not significant. Low PCB concentrations, high material volumes, and technology limitations make treatment impractical.
Short-term Effectiveness	<ul style="list-style-type: none"> No short-term adverse impacts. Removal of fish consumption advisories could increase short-term risk. 	<ul style="list-style-type: none"> Short-term effectiveness high since natural recovery is not disrupted and monitoring and institutional controls are implemented quickly. 	<ul style="list-style-type: none"> Short-term impacts include localized disruption of habitats in former impoundments, localized disruption of recreational activities, moderate increase in local truck traffic. 	<ul style="list-style-type: none"> All potential impacts for Alternative 3 apply. River-wide disruption or destruction of wildlife habitat. Significant increase in site-wide truck traffic. Worker safety risks created due to 40-year time frame and construction complexity. 	<ul style="list-style-type: none"> All potential impacts for Alternative 3 apply. River-wide destruction of benthos and wildlife habitat. Significant increase in site-wide truck traffic. Worker safety risks created due to 25-year time frame and construction complexity.
Implementability	<ul style="list-style-type: none"> Technically and administratively feasible. 	<ul style="list-style-type: none"> Technically and administratively feasible. 	<ul style="list-style-type: none"> Technically and administratively feasible. Bank stabilization uses reliable and conventional methods and materials. 	<ul style="list-style-type: none"> Administratively feasible. 40-year time frame. 14,500,000 cubic yards of materials necessary. 2,500,000 truck trips to move materials on and off site. 	<ul style="list-style-type: none"> Achieving cleanup goals may be technically infeasible. Siting on-site disposal CDFs administratively difficult. 25-year time frame. 29,000,000 cubic yards of materials necessary, and 4,600,000 truck trips.
Cost (NPV = Net Present Value)	No capital or O&M costs.	Capital = \$0 O&M = \$1,186,000 Total = \$1,186,000 (\$653,000 NPV)	Capital = \$43,340,000 O&M = \$29,846,000 Total = \$73,186,000 (\$40,679,000 NPV)	Capital = \$961,980,000 O&M = \$772,402,000 Total = \$1,734,382,000 (\$300,494,000 NPV)	Capital = \$2,552,230,000 O&M = \$66,215,000 Total = \$2,618,445,000 (\$839,747,000 NPV)

Proposed Remedial Plan

After a thorough assessment, which included consideration of the findings of the RI and risk evaluations as well as a comparative evaluation against NCP criteria, the most timely, reliable, cost-effective, and protective remedial alternative was determined to be Alternative 3 (stabilization of eroding banks in the former impoundments, monitored natural attenuation, and institutional controls). On balance, Alternative 3 is expected to deliver the greatest overall level of risk reduction in fish, surface water, and surface sediment while minimizing habitat impacts and construction-related risks during implementation.

Alternative 3 is expected to reduce risks primarily through source control and natural recovery, a viable approach recognized by the USEPA in its national Contaminated Sediment Management Strategy. Specifically, the eroding riverbanks in the former impoundments would be stabilized to control that source of PCBs, an extensive monitoring program would track the continued effectiveness of natural attenuation, maintenance of institutional controls such as fish consumption advisories would continue, and other uncontrolled PCB sources would be investigated for possible further response action by MDEQ.

This plan will be effective not only because of its ability to reduce risks. It also avoids most of the negative impacts inherent in the more intrusive alternatives (Alternatives 4 and 5), such as protracted time frames, highly complex construction projects, potentially serious worker safety risks, and widespread destruction of habitats both in the river and along its banks.

Further, the proposed remedial plan is designed to complement the benefits already achieved through remediation of the KRSR mill properties and OUs and work in conjunction with the ongoing natural recovery processes already responsible for significant improvements in river conditions over the past two decades. In fact, based on modeling and analyses

presented in the RI/FS reports and the Supplement report, Alternative 3 is expected to speed up decreases in PCB levels in fish, water, and surface sediment. The comprehensive maintenance and monitoring program, and regulatory review required every 5 years at all Superfund sites, will include measurement of the remedy's actual performance against predicted performance to ensure the remedy is protective over the long term.

During implementation of the remedy, institutional controls would be maintained to continue to protect

human health and reduce risks from PCB exposure. For example, fish consumption advisories (the best interim protection from the only PCB-exposure pathway for humans) would continue to be issued by MDCH, and all dams and impoundment pool elevations would be maintained by their owners to ensure that existing PCB-containing sediment deposits remain stable and immobilized behind the dams.

Extensive new data have been collected in recent years and applied to the "KALSIM" fate and transport model being developed for the Kalamazoo River. These up-to-date data and the new modeling tool have helped increase the level of confidence in the evaluation of remedial alternatives. As explained in detail in the Supplement to the RI/FS, the model has been developed using data collected from the

Kalamazoo River and its watershed, and is a good tool for evaluating the expected outcomes of remedial alternatives.

When the model was set to closely mimic actual conditions and how PCBs, sediments, and water move through the system, all five remedial alternatives were programmed into the model and resulting conditions were forecast up to 40 years into the future. As shown in the figure on the next page, the results confirmed what simpler calculations had concluded in the RI and FS reports: the eroding riverbanks of the three former impoundments are the highest priority for remediation, and large-scale remediation of river (submerged)

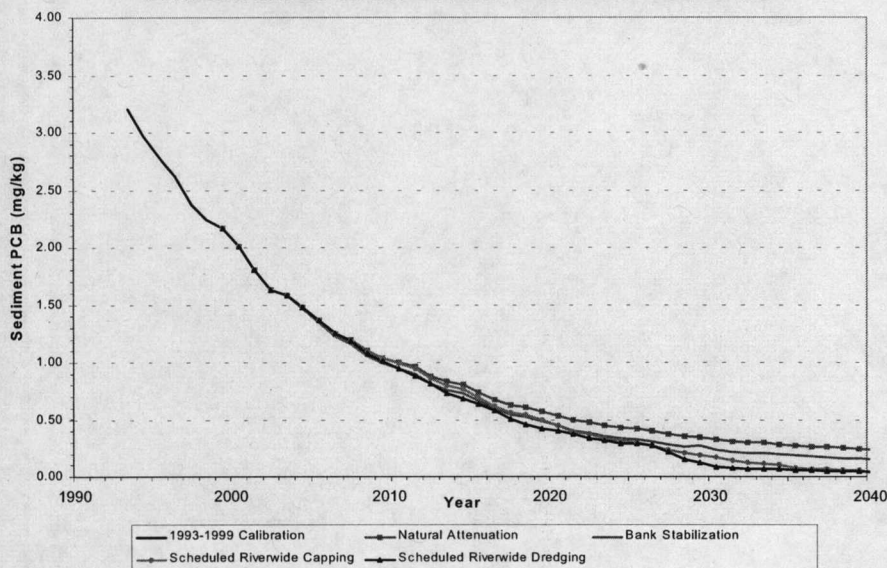
Primary Benefits of Alternative 3

- Remedy will reduce risks and achieve all three remedial objectives:
 - reduce PCB levels in fish
 - reduce PCB transport
 - reduce PCB loading
- Source control (bank stabilization) will increase rate and effectiveness of natural recovery.
- Comprehensive long-term monitoring program will track effectiveness of remedy.
- Short-term risks due to construction and habitat destruction are minimized.
- Design and construction will take just 6 years and use proven, reliable methods.
- Over \$73 million in capital and O&M costs would be invested in risk reduction efforts and long-term monitoring of remedy performance.
- Remedy performance would be monitored and carefully reevaluated by MDEQ and USEPA every five years, as required by CERCLA.
- Alternative 3 delivers the greatest overall net environmental benefits to the community and Kalamazoo River watershed.

sediments would do little to improve upon the gains already achieved through more than two decades of natural recovery.

Coupled with work already accomplished and the assurances through long-term monitoring that natural recovery and the additional source controls proposed will perform as expected, the proposed remedy will significantly speed up recovery of the river and reduce potential risks posed by PCBs to anglers and local wildlife.

KALSIM Model Forecast of Lake Allegan Surface Sediment PCB Concentrations under Different Remedial Scenarios



Compared to more intrusive and complex capping or dredging remedies, Alternative 3 (bank stabilization and natural recovery) reduces PCB concentrations (and risks) over similar time frames, but with far fewer adverse impacts and for less cost. Using the KALSIM model, the above graph shows forecasted trends for Lake Allegan surface sediment PCB concentrations.

The Future...What's Next?

Once the RI/FS reports are reviewed and approved by the MDEQ, a formal "Proposed Plan" document will be prepared to summarize the preferred remedy and formally present it to the public for review and comment. A public comment period (typically 30 days) then follows to gather input on the plan from local residents and numerous other stakeholders. During the comment period, MDEQ will hold one or more public meetings to present the Proposed Plan and gather public comments first-hand.

After all comments are received, the MDEQ will prepare the Record of Decision (ROD) to explain in detail what the final remedial plan will be and

what legal and technical requirements it must meet to be successful. When the ROD is finished and signed, engineers will begin to design and construct the remedy. Following construction, the long-term monitoring and maintenance program would ensure that the remedy performs as designed. Every 3 to 5 years, samples are collected to track the effectiveness of the remedy. In addition, MDEQ and USEPA would conduct regulatory reviews every 5 years to assess remedy performance.

In summary, Alternative 3 is expected to deliver the greatest overall net benefits to local communities and the Kalamazoo River watershed through timely implementation of a project that will invest over \$73 million in effective risk reduction measures and long-term monitoring of remedy performance. Moreover, this proposed work is in addition to the significant remedial actions already accomplished in recent years at the four landfill operable units and other KRSG properties on the Kalamazoo River and Portage Creek.

For More Information...

Additional information and reports are available at the local libraries listed below:

Allegan Public Library

331 Hubbard St.
Allegan, Michigan
(616) 673-4625

Waldo Library

Western Michigan University
Kalamazoo, Michigan
(616) 387-5156

Kalamazoo Public Library

315 South Rose
Kalamazoo, Michigan
(616) 342-9837

Saugatuck-Douglas District Library

10 Mixer St.
Douglas, Michigan
(616) 857-8241

Charles Ransom District Library

180 South Sherwood Ave.
Plainwell, Michigan
(616) 685-8024

Otsego District Library

219 South Farmer St.
Otsego, Michigan
(616) 694-9690